

AUTOMOTIVE: ELECTRONICS

COURSE DESCRIPTION

Automotive: Electronics is a course that prepares students for entry-level positions or advanced training in automotive electrical and electronics systems. Students apply principles of electronics to automotive technology and develop diagnostic skills. The course provides students the opportunity to acquire marketable skills by training in the use of digital and analog voltmeters, ohmmeters, and amp-meters; as well as oscilloscopes, test-lights, load-testers and specialized electrical test equipment. Education experiences simulate automotive service industry operations through the use of training aids and modules and school-based learning opportunities.

Course content prepares students for the Automotive Service Excellence (ASE) Electrical and Electronics.

Prerequisite:

Transportation Core

Algebra I or Math for Technology II; Physical Science or Principles of Technology I (may be concurrent)

Requirement:

A minimum of 200 hours must be dedicated to electrical and electronics to meet minimum standards set by NATEF.

Recommended Credits:

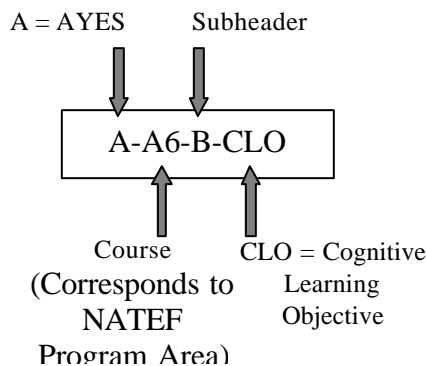
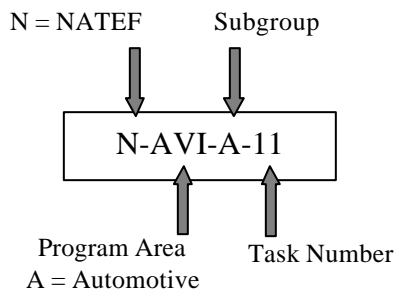
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Recommended Grade Level:

10th, 11th, or 12th

Note: Course is aligned with NATEF task list for Automotive: Electronics systems. Items have been organized based on requirements of Tennessee required course description format.

Electrical



AUTOMOTIVE: ELECTRONICS STANDARDS
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- 1.0 Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 2.0 Students will demonstrate automotive technology safety practices, including Occupational Safety and Health Administration and Environmental Protection Agency requirements for an automotive repair facility.
- 3.0 Students will apply fundamental electrical, electronic, and electromagnetic concepts to automotive service technology.
- 4.0 Students will properly test, diagnose, and repair or service automotive general electrical systems.
- 5.0 Students will properly test, diagnose, and service automotive batteries.
- 6.0 Students will properly test, diagnose, and repair or service automotive starting systems.
- 7.0 Students will properly test, diagnose, and repair or service automotive charging systems.
- 8.0 Students will properly test, diagnose, and repair or service automotive lighting systems.
- 9.0 Students will properly test, diagnose, and repair automotive gauges, driver information systems, warning circuits, and electrical accessories.
- 10.0 Students will demonstrate communication skills required in the automotive service industry.
- 11.0 Students will demonstrate interpersonal and employability skills required in the automotive service industry.

AUTOMOTIVE: ELECTRONICS

STANDARD 1.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

LEARNING EXPECTATIONS

The student will:

- 1.1 Lead a team.
- 1.2 Participate in SkillsUSA-VICA as an integral part of classroom instruction.
- 1.3 Assess client complaint and apply problem-solving and decision-making skills to communicate with the client.
- 1.4 Demonstrate teamwork skills.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 1.1.A As a team leader, demonstrates character and leadership skills to accomplish a project.
- 1.1.B Evaluates the effectiveness of a team and develops a plan for improvement.
- 1.2.A Applies the points of the creed and purposes of SkillsUSA-VICA in the classroom and laboratory.
- 1.2.B Demonstrates rules of parliamentary procedure to express ideas to a group.
- 1.3.A Analyzes situations in the workplace and uses conflict resolution techniques to solve the problem.
- 1.3.B Follows work order and communicates with client.
- 1.4 Participates in a group to diagnose electrical systems.

SAMPLE PERFORMANCE TASKS

- Analyze the classroom and laboratory structure. Compile a proposal to organize the classroom and laboratory to show improvement in effectiveness.
- Participate in various SkillsUSA-VICA programs and/or competitive events.
- Evaluate an activity within the school, community, and/or workplace and develop a plan for improvement using teamwork skills.
- Implement an annual program of work.
- Prepare a meeting agenda for a SkillsUSA-VICA monthly meeting.
- Attend a professional organization meeting or trade show relating to the automotive service industry.

INTEGRATION LINKAGES

SkillsUSA-VICA, *Professional Development Program*, SkillsUSA-VICA, Communications and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Math, Math for Technology, Applied Communications, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

AUTOMOTIVE: ELECTRONICS

STANDARD 2.0

Students will demonstrate automotive technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for an automotive repair facility.

LEARNING EXPECTATIONS

The student will:

- 2.1 Determine safe and correct procedures for working with electricity in an automotive repair facility.
- 2.2 Use protective clothing, eye protection, and safety equipment.
- 2.3 Use fire protection equipment.
- 2.4 Follow OSHA and EPA regulations and manufacturers specifications affecting electrical and electronic automotive systems.
- 2.5 Respond to safety communications referring to electrical and electronic systems.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 2.1.A Conforms to federal, state, local regulations, and manufacturer's specifications when working with electricity.
- 2.1.C Inspects first aid supplies and determines supplies and procedures for electrical injuries.
- 2.2.A Demonstrates proper usage of special safety equipment used while working on electrical and electronic systems.
- 2.2.B Selects and uses the appropriate protective clothing and eye protection.
- 2.3.A Selects the proper fire extinguisher for an electrical fire.
- 2.3.B Demonstrates the proper use of a fire extinguisher and determines effectiveness.
- 2.4.A Locates regulatory information and manufacturer recall information pertaining to electrical and electronic systems.
- 2.4.B Extracts information from Material Safety Data Sheets.
- 2.4.C Complies with relevant regulations and standards pertaining to electrical and electronic systems.
- 2.4.D Passes with 100% accuracy a written examination relating specifically to electrical and electronic safety issues.
- 2.4.E Passes with 100% accuracy a performance examination relating specifically to electrical and electronic tools and equipment.
- 2.4.F Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.
- 2.5.A Interprets manufacturer correspondence for safety regulations.
- 2.5.B Complies with safety procedures.

SAMPLE PERFORMANCE TASKS

- Assess the work area for safety hazards.
- Design a corrections program for identified hazards.
- Model the appropriate protective equipment for an assigned task.
- Read manufacturer specifications to determine safe practices while working on various electrical and electronic systems.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Electronics Technology Literacy, Applied Communications, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ELECTRONICS

STANDARD 3.0

Students will apply fundamental electrical, electronic, and electromagnetic concepts to automotive service technology.

LEARNING EXPECTATIONS

The student will:

- 3.1 Analyze the basic characteristics of electricity.
- 3.2 Apply Ohm's law to automotive technology.
- 3.3 Examine electrical circuit structures.
- 3.4 Determine the role of electromagnetism in automotive technology.
- 3.5 Explore the use of Digital Multimeters (DMM) in automotive technology.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 3.1.A Correlates basic electrical concepts with automotive electrical uses and functions. A-A6-1-CLO
- 3.1.B Illustrates the concepts of valence, voltage, current, resistance, and voltage drop. A-A6-1-CLO
- 3.1.C Compares the two theories of current flow and indicates which theory is used in automotive technology. A-A6-1-CLO
- 3.1.D Distinguishes between conductor, insulator, and semi-conductor. A-A6-1-CLO
- 3.1.E Distinguishes between DC (direct current) and AC (alternating current). A-A6-1-CLO
- 3.2.A Deduces the cause and effect relationship in Ohm's law between voltage, current, resistance, and voltage drop. A-A6-1-CLO
- 3.2.B Uses Ohm's law to determine values mathematically. A-A6-1-CLO
- 3.3.A Analyzes series circuit structure both in application and mathematically. A-A6-1-CLO
- 3.3.B Analyzes parallel circuit structure both in application and mathematically. A-A6-1-CLO
- 3.3.C Analyzes series-parallel circuit structure both in application and mathematically. A-A6-1-CLO
- 3.3.D Differentiates between a short and a ground. A-A6-1-CLO
- 3.3.E Researches the future use of 36 and 42 voltage systems in the automotive industry.
- 3.4.A Compares magnetism and electromagnetism. A-A6-1-CLO
- 3.4.B Illustrates electromagnetic induction and magnetomotive force. A-A6-1-CLO
- 3.4.C Compares concepts of magnetism to their electrical counterparts: reluctance to resistance, field distance to voltage, and magnetic force to current. A-A6-1-CLO
- 3.4.D Analyzes the role of magnetism and electromagnetic induction in vehicle components such as motors, alternators, starters, relays, and solenoids. A-A6-1-CLO
- 3.5.A Demonstrates the function of a digital multimeter (DMM). A-A6-1-CLO
- 3.5.B Measures voltage, voltage drop, current, resistances, and continuity in automotive circuits using a digital multimeter (DMM). A-A6-1-CLO

SAMPLE PERFORMANCE TASKS

- In teams, construct a series, parallel, and series-parallel circuit and use them to solve circuit problems. Develop a presentation for the Tennessee SkillsUSA-VICA competition.
- Point out all sources of electricity on a vehicle.
- Use a Digital Multimeter (DMM) to measure the voltage of a sample automotive electrical circuit.
- Using the Internet, research the use of 36 and 42 voltage systems in the automotive industry. Prepare a presentation to show the changes that will be brought about because of the use of high voltage systems.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Electronics Technology Literacy, Applied Communications, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ELECTRONICS

STANDARD 4.0

Students will properly test, diagnose, and repair or service automotive general electrical systems.

LEARNING EXPECTATIONS

The student will:

- 4.1 Interpret schematics, diagrams, and reference information used in automotive electrical diagnosis.
- 4.2 Use strategy-based diagnostics for determining the cause of a fault in an electrical circuit.
- 4.3 Demonstrate the use of equipment and tools for electrical testing and diagnosis.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 4.1.a Interprets blueprints and electrical schematics. A-A6-3-ICS.
- 4.1.B Uses wiring diagrams during diagnosis of electrical circuit problems. N-AVI-A-1
- 4.1.C Extracts technical information from service manual, graphs, and charts. A-A6-3-ICS
- 4.2.A Uses a scientific process of elimination to narrow the list of possible causes of an electrical circuit fault. A-A6-3-CLO
- 4.2.B Uses the service manual and electronic service information (ESI) to aid in diagnosis of an electrical circuit fault. A-A6-3-ICS
- 4.2.C Implements strategy based diagnostic procedure by verifying the complaint, defining the problem, isolating the problem, validating the problem, making repairs, and testing the repairs in an electrical system.
- 4.3.A Checks electrical circuits using a test light, scan tool, digital multimeter (DMM), jumper wires, ammeter, voltmeter, oscilloscope, and ohmmeter. N-AVI-A-2, N-AVI-A-3, N-AVI-A-6, N-AVI-A-5, N-AVI-A-6
- 4.3.B Locates shorts, grounds, opens, abnormal key-off battery drain, and resistance problems; determines cause and performs necessary action. N-AVI-A-7, N-VI-A-8
- 4.3.C Inspects and tests switches, connectors, relays and wires of electrical/electronic circuits; determines if there is a problem and performs necessary action. N-AVI-A-9
- 4.3.D Inspects and tests fusible links, circuit breakers; determines if there is a problem and performs necessary action. N-AVI-A-10

SAMPLE PERFORMANCE TASKS

- In teams, diagnose problems in a circuit and make recommendations to correct it.
- Diagnose and repair electrical systems such as ignition, charging, starting, fuel injections, power door locks, and horn operations
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings

based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Electronics Technology Literacy, Applied Communications, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ELECTRONICS

STANDARD 5.0

Students will properly test, diagnose, and service automotive batteries.

LEARNING EXPECTATIONS

The student will:

- 5.1 Analyze the function and operation of a battery.
- 5.2 Diagnose battery problems.
- 5.3 Perform battery service.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 5.1.A Illustrates the operation of a battery. A-A6-4-CLO
- 5.1.B Differentiates between the various battery capacities and ratings. A-A6-4-CLO
- 5.1.C Locates and follows battery safety procedures. A-A6-4-CLO
- 5.1.D Disposes of batteries in compliance with EPA standards.
- 5.2.A Inspects battery, battery cables, connectors, clamps, and hold-downs. N-AVI-B-6
- 5.2.B Performs battery state-of-charge test and determines needed service. N-AVI-B-1
- 5.2.C Performs battery capacity test and determines needed service. N-AVI-B-2
- 5.2.D Tests parasitic loads and diagnoses intermittent parasitic loads.
- 5.2.E Performs Engine Control Module (ECM) draw test.
- 5.3.A Cleans battery clamps, cables, connectors, and hold-downs; repairs or replaces as needed. N-AVI-B-6
- 5.3.B Cleans and fills a battery. N-AVI-B-4
- 5.3.C Performs a slow/fast battery charge. N-AVI-B-5
- 5.3.D Installs/replaces a battery.
- 5.3.E Starts a vehicle using jumper cables and a battery or auxiliary power supply according to manufacturer's recommended procedures. N-AVI-B-7
- 5.3.F Maintains or restores electronic memory functions. N-AVI-B-3

SAMPLE PERFORMANCE TASKS

- Jump-start a vehicle.
- Determine if a battery should be replaced or recharged by performing an open-circuit voltage test and then a capacity test.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Electronics Technology Literacy, Applied Communications, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ELECTRONICS

STANDARD 6.0

Students will properly test, diagnose, and repair or service automotive starting systems.

LEARNING EXPECTATIONS

The student will:

- 6.1 Analyze the function and operation of an automotive starting system.
- 6.2 Diagnose starting system problems.
- 6.3 Perform starting system service.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 6.1.A Illustrates the principles and operation of a starting system. A-A6-6-CL0
- 6.1.B Distinguishes the function of the various components of a starting system. A-A6-6-CL0
- 6.2.A Performs starter current draw tests and determines necessary action. N-AVI-C-1
- 6.2.B Performs starter circuit voltage drop tests and determines necessary action. N-AVI-C-2
- 6.2.C Inspects and tests starter relays and solenoids and determines necessary action. N-AVI-C-3
- 6.2.D Performs starter bench tests and determines necessary action. N-AVI-C-5
- 6.2.E Inspects and tests switches, connectors, and wires of starter control circuits and determines necessary action. N-AVI-C-6
- 6.2.F Disassembles, cleans, inspects, and tests starter components. N-AVI-C-7
- 6.2.G Implements strategy based diagnostic procedure by verifying the complaint, defining the problem, isolating the problem, validating the problem, making repairs, and testing the repairs in a starting system.
- 6.3.A Replaces starter relays and solenoids as needed. N-AVI-C-3
- 6.3.B Removes and installs starter. N-AVI-C-4
- 6.3.C Repairs switches, connectors, and wires of starter control circuits as needed. N-AVI-C-6
- 6.3.D Replaces starter components as needed. N-AVI-C-7

SAMPLE PERFORMANCE TASKS

- Test the starter electrical circuit.
- Remove and replace a starter motor.
- Perform a starter draw test.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Electronics Technology Literacy, Applied Communications, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ELECTRONICS

STANDARD 7.0

Students will properly test, diagnose, and repair or service automotive charging systems.

LEARNING EXPECTATIONS

The student will:

- 7.1 Analyze the function and operation of an automotive charging system.
- 7.2 Diagnose charging system problems.
- 7.3 Perform charging system service.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 7.1.A Illustrates the principles and operation of a charging system. A-AVI-5-CLO
- 7.1.B Distinguishes the function of the components of a charging system. A-AVI-5-CLO
- 7.1.C Illustrates the principles and operation of a generator (alternator). A-AVI-5-CLO
- 7.1.D Distinguishes the function of the components of a generator (alternator). A-AVI-5-CLO
- 7.2.A Performs charging system output test and determines necessary action. N-AVI-D-1
- 7.2.B Diagnoses charging system for the cause of undercharge, no-charge, or overcharge conditions. N-AVI-D-2
- 7.2.C Performs charging circuit voltage drop tests and determines necessary action. N-AVI-D-7
- 7.2.D Disassembles generator (alternator); cleans, inspects, and tests components; and determines necessary action. N-AVI-D-6
- 7.2.E Inspects generator (alternator) drive belts and determines necessary action. N-AVI-D-3
- 7.2.F Inspects and tests voltage regulator/regulating circuit and determines necessary action. N-AVI-D-4
- 7.2.G Implements strategy based diagnostic procedure by verifying the complaint, defining the problem, isolating the problem, validating the problem, making repairs, and testing the repairs in a charging system.
- 7.3.A Replaces/installs generator (alternator). N-AVI-D-5
- 7.3.B Repairs or replaces voltage regulator/regulating circuit. N-AVI-D-2
- 7.3.C Adjusts or replaces generator (alternator) drive belts and other alternator components as needed. N-AVI-D-3

SAMPLE PERFORMANCE TASKS

- Check alternator amperage output.
- Repair an alternator component.
- Adjust a drive belt.
- Inspect charging system for overcharge or no charge.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Electronics Technology Literacy, Applied Communications, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ELECTRONICS

STANDARD 8.0

Students will properly test, diagnose, and repair or service automotive lighting systems.

LEARNING EXPECTATIONS

The student will:

- 8.1 Analyze the operation of automotive lighting systems.
- 8.2 Diagnose lighting system problems.
- 8.3 Perform lighting system service.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 8.1.A Illustrates the operation of lighting systems including brake and turn signals, dome lights, and reverse lights. A-A6-8-CLO
- 8.1.B Pinpoints the location of switches that activate the lighting systems. A-A6-8-CLO
- 8.2.A Uses the service manual and ESI (Electronic Service Information) to assist in diagnosing causes of a fault in an electrical circuit. A-A6-8-ICS
- 8.2.B Checks operation of brake stop light system.
- 8.2.C Diagnoses the cause of brighter than normal, intermittent, dim, or no light operation; determines necessary action. N-AVI-E-1
- 8.2.D Inspects, diagnoses, and repairs faulty turn signal or hazard light operation. N-AVI-E-3
- 8.2.E Inspects headlights and bulbs. N-AVI-E-2
- 8.2.F Implements strategy based diagnostic procedure by verifying the complaint, defining the problem, isolating the problem, validating the problem, making repairs, and testing the repairs in an lightening system.
- 8.3.A Adjusts and services brake light system.
- 8.3.B Tests and replaces fuses, fusible links, and circuit breakers.
- 8.3.C Replaces and aims headlights and bulbs. N-AVI-E-2
- 8.3.D Repairs wiring harnesses and connectors.
- 8.3.E Performs solder repair on electrical wiring.
- 8.3.F Implements strategy based diagnostic procedure by verifying the complaint, defining the problem, isolating the problem, validating the problem, making repairs, and testing the repairs in an wiring harness system.

SAMPLE PERFORMANCE TASKS

- Determine lighting problem in tail light.
- Replace tail light bulb.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Electronics Technology Literacy, Applied Communications, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ELECTRONICS

STANDARD 9.0

Students will properly test, diagnose, and repair automotive gauges, driver information systems, warning circuits, and electrical accessories.

LEARNING EXPECTATIONS

The student will:

- 9.1 Analyze the operation of automotive gauges, sending units, warning lights, speedometers, tachometers, electronic instrument panels and accessories.
- 9.2 Diagnose problems with gauges, sending units, warning lights, speedometers, tachometers, electronic instrument panels and accessories.
- 9.3 Perform repairs on gauges, sending units, warning lights, speedometers, tachometers, electronic instrument panels and accessories.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 9.1.A Illustrates the functions and operation of gauges and sending units. A-A6-9-CLO
- 9.1.B Illustrates the functions and operation of warning lights, speedometers, tachometers, and electronic instrument panels. A-A6-9-CLO
- 9.2.A Inspects and tests oil temperature and pressure sensors and switches.
- 9.2.B Checks operation of parking brake indicator light system.
- 9.2.C Inspects and tests gauges and gauge sending units for cause of intermittent, high, low or no gauge readings and determines necessary action. N-AVI-F-1
- 9.2.D Inspects and tests connectors, wires, and printed circuit boards of gauge circuits and determines necessary action. N-AVI-F-2
- 9.2.E Diagnoses the cause of incorrect operation of:
 - warning devices and other driver information systems, N-AVI-F-3
 - horn, N-AVI-G-1
 - wiper speed control and park problems, N-AVI-G-2
 - windshield washer, N-AVI-6-2
 - motor-driven accessory circuits, N-AVI-H-1
 - heated glass, N-AVI-H-2
 - electric locks, N-AVI-H-3
 - cruise control systems, N-AVI-H-4
 - supplemental restraint systems, N-AVI-H-5 and
 - radio (static and weak, intermittent, or no radio reception), and determines necessary action. N-AVI-H-6
- 9.2.F Inspects and tests sensors, connectors, and wires of electronic instrument circuits and determines necessary action. N-AVI-F-4
- 9.2.G Implements strategy based diagnostic procedure by verifying the complaint, defining the problem, isolating the problem, validating the problem, making repairs, and testing the repairs on driver information systems.

- 9.3.A Replaces oil temperature and pressure sensors and switches. N-AVI-F-3
- 9.3.B Repairs wiring harnesses and connectors.
- 9.3.C Performs solder repair of electrical wiring. N-AVI-F-2, N-AVI-F-4
- 9.3.D Repairs sensors and printed circuit boards of gauge circuits. N-AVI-F-2

SAMPLE PERFORMANCE TASKS

- Repair rear window heated glass system.
- Diagnose and repair car radio.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Electronics Technology Literacy, Applied Communications, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ELECTRONICS

STANDARD 10.0

Students will demonstrate communication skills required in the automotive service industry.

LEARNING EXPECTATIONS

The student will:

- 10.1 Communicate and comprehend oral and written information pertaining to electrical and electronic systems.
- 10.2 Solve electrical problems and make decisions using a logical process.
- 10.3 Use teamwork skills to solve problems relating to electrical and electronic system issues.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 10.1.A Interprets and uses written information in common job formats, such as tables, charts, and reference materials and manuals to solve electrical and electronic system problems.
- 10.1.B Interprets and uses graphical information such as blueprints, electrical schematics, process control schematics, automotive flow charts, and other automotive diagrams to solve electrical and electronic system problems.
- 10.1.C Uses electronic resources to obtain electrical and electronic service and other automotive information.
- 10.1.D Analyzes information obtained from various sources to determine an electrical and electronic diagnostic solution.
- 10.1.E Interprets an automotive repair order for an electrical/electronic system.
- 10.2.A Develops a hypothesis regarding the cause of a problem.
- 10.2.B Tests the hypothesis to determine the solution to the electrical/electronic problem.
- 10.2.C Creates, evaluates, and revises a plan to resolve a problem.
- 10.2.D Implements strategy based diagnostic procedure by verifying the complaint, defining the problem, isolating the problem, validating the problem, making repairs, and testing the repairs in an electrical/electronic system.
- 10.3.A Serves in each of the functional roles of a team.
- 10.3.B Resolves conflicts within a group.
- 10.3.C Demonstrates appropriate and positive examples of giving and accepting criticism.
- 10.3.D Modifies behavior or revises work based on appropriate criticism.
- 10.3.E Solves problems in cooperation with other members of a group.
- 10.3.F Evaluates the role of the automotive technician within the organizational system of a dealership or fleet shop.

SAMPLE PERFORMANCE TASKS

- Use reference materials to determine procedures for diagnosing and testing automotive electrical systems.
- Work as a team member to develop a diagnostic strategy.
- Use blueprints and diagrams to execute a task.
- Use professional and technical language in the classroom and laboratory.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Electronics Technology Literacy, Applied Communications, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ELECTRONICS

STANDARD 11.0

Students will demonstrate interpersonal and employability skills required in the automotive services industry.

LEARNING EXPECTATIONS

The student will:

- 11.1 Infer relationships between honesty, integrity, and organization and personal job success.
- 11.2 Demonstrate attitudes conducive to workplace success.
- 11.3 Maintain electrical and electronic equipment in a neat and orderly work area.
- 11.4 Assess implications of cultural and religious diversity for classroom and workplace relationships.
- 11.5 Develop individual and team time management and work sequencing skills to increase productivity in electrical and electronic systems diagnostics and repair.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 11.1.A Illustrates the concept of integrity.
- 11.1.B Assesses the potential impact of an individual's work ethic on an organizational system.
- 11.1.C Infers the relationship between organization and personal job success in electrical and electronics system servicing.
- 11.2.A Modifies behavior to increase productivity in the classroom, laboratory and workplace.
- 11.2.B Demonstrates awareness of activities occurring concurrently in the classroom and workplace.
- 11.3.A Keeps electrical and electronic equipment in a clean and organized work area.
- 11.3.B Maintains work area according to NATEF and OSHA standards.
- 11.3.C Recognizes the correlation between a clean orderly work environment and successful and efficient job in electrical and electronics systems servicing.
- 11.4.A Assesses benefits and predicts problems that may arise from diversity in work teams.
- 11.4.B Devises solutions to problems arising from gender, cultural, racial, and religious diversity.
- 11.5.A Assesses the benefits of incorporating time management principles into electrical and electronic system servicing.
- 11.5.B Displays time management and work sequencing skills in electrical and electronic system servicing.
- 11.5.C Demonstrates the ability to diagnose and repair electrical and electronic systems within manufacturers labor operation time.

SAMPLE PERFORMANCE TASKS

- Maintain an orderly work area.
- Lead a problem-solving team.
- Consistently arrive at class on time.
- Participate in an internship in a dealership.
- Resolve an interpersonal conflict in the classroom.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Electronics Technology Literacy, Applied Communications, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES Curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ELECTRONICS

SAMPLING OF AVAILABLE RESOURCES

A6 Automotive Electrical/Electronics Course, AYES Curriculum, AYES Corporation,
www.ayes.org

A0 Fundamentals of Automotive Service Technology, AYES Curriculum: A Tenth Grade Course,
AYES Corporation, www.ayes.org

A6 Electrical/Electronic Systems, CD-ROM, Interactive Computer Based Training, DVP/CDX,
1-888-873-2239

Fundamentals of Electronics, Russell Meade, Delmar Publishing

Fundamentals of Electric and Electronic Circuits, Mandl, Prentice Hall

Introduction to Automotive Service Technology, Service Series, Curriculum and Instructional
Material Center (CIMC), Oklahoma Department of Vocational and Technical Education

Module 1 Introduction to Automotive Technology, Instructional Materials Laboratory (IML),
University of Missouri

1999 Automobile Task List, National Automotive Technicians Education Foundation (NATEF),
www.natef.org